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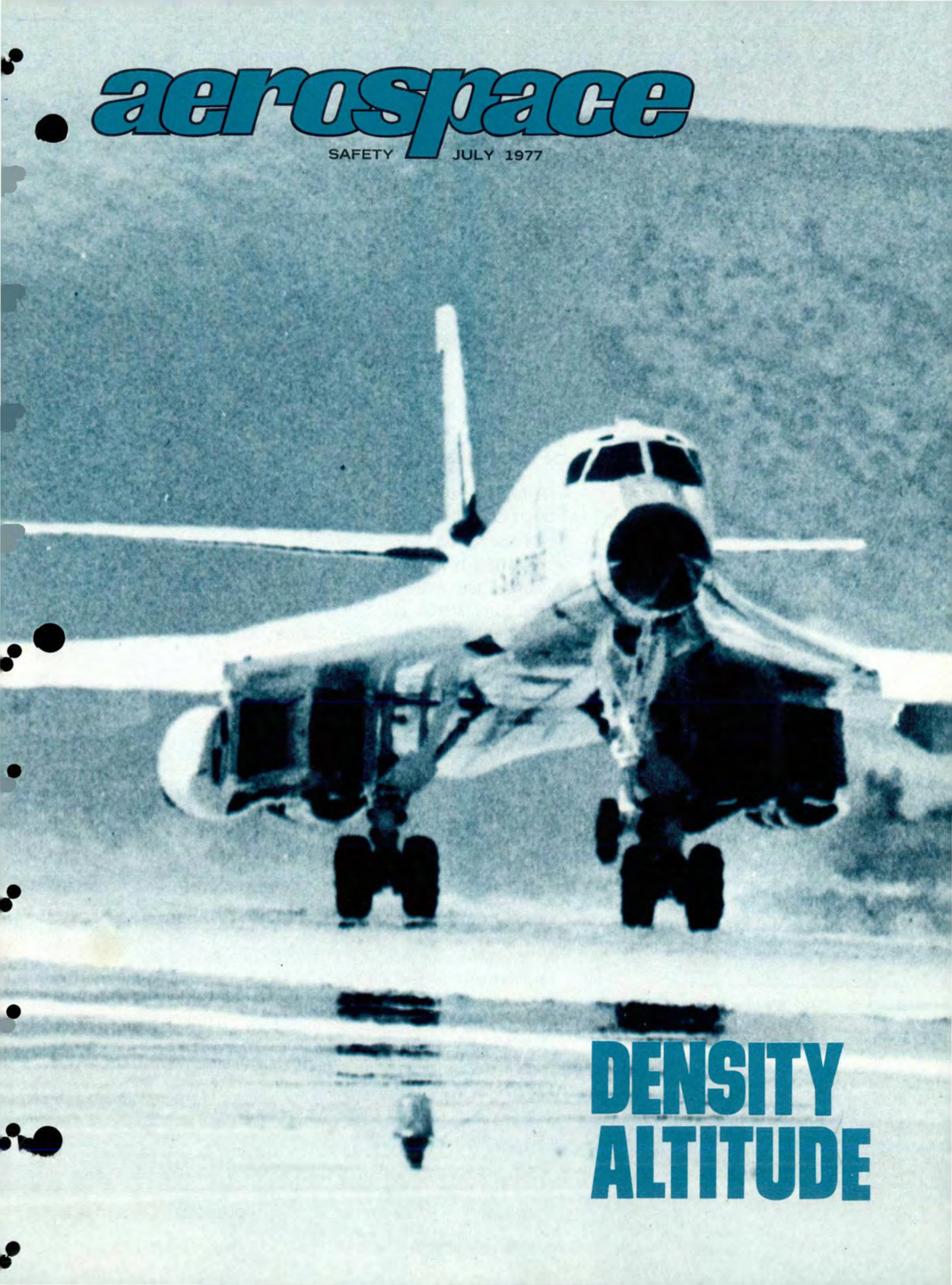
SAFETY JULY 1977



DENSITY ALTITUDE

JULY 1977

UNITED STATES AIR FORCE

aerospace SAFETY

THE MISSION - - - - - - SAFELY!

SPECIAL FEATURES

REGULAR FEATURES

NAME THAT PLANE

BOEING B-9

The B-9 introduced new aerodynamic concepts as a low wing all metal monoplane. The real departure was in the design of the B-9 specifically for strategic bombing rather than as a multi-purpose aircraft as the earlier bombers had been. Although the B-9 still had open cockpits, the new design features marked the first real steps toward the great bombers of World War II.

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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JULY 1977 AFRP 127-2 VOLUME 33 NUMBER 7

NEWS FOR CREWS

CAPT RICHARD D. MARTIN, AFMPC

Rated Special Duty Assignments

AFR 36-20 (THE OFFICER ASSIGNMENTS REGULATION) OUTLINES IN CHAPTER 8 A CATEGORY OF ASSIGNMENTS KNOWN AS "SPECIAL DUTY ASSIGNMENTS (SDAS)." THE DUTIES INVOLVED PROVIDE UNIQUE AND CHALLENGING OPPORTUNITIES TO CAPABLE OFFICERS WITH STRONG PERFORMANCE RECORDS. MOST RATED OFFICERS ARE FAMILIAR WITH A NUMBER OF THESE ASSIGNMENTS, BUT ARE OFTEN UNCERTAIN OF FULL ELIGIBILITY CRITERIA AND APPLICATION PROCEDURES. ADDITIONALLY, WE FIND THAT SOME OFFICERS ARE RELUCTANT TO APPLY, BELIEVING THE CHANCES OF SELECTION ARE SLIM. OFTEN THE OPPOSITE MAY BE TRUE, IN THAT ADDITIONAL QUALIFIED VOLUNTEERS ARE NEEDED.

ALTHOUGH CHAPTER 8 COVERS BOTH SUPPORT AND RATED SPECIAL DUTY ASSIGNMENTS, IN THIS ISSUE WE WILL REVIEW ONLY RATED SDAS. IF AFTER THE BRIEF REMINDER OF SDAS PROVIDED HERE YOU BELIEVE YOU WOULD ENJOY PERFORMING DUTY IN A SDA, WE URGE YOU TO CONSULT AFR 36-20 FOR FULL DETAILS AND FOLLOW UP WITH AN APPLICATION. SPECIFIC RATED SDAS FOLLOW.

Air National Guard and USAF Reserve Program Advisors

REQUIRES SENIOR CAPTAINS THROUGH FIELD GRADE PILOTS AND NAVIGATORS WITH STRONG RECENT EXPERIENCE IN RESERVE COMPONENT AIRCRAFT.

US Military Groups (USMILGP) Latin America

PRIMARY REQUIREMENTS ARE FOR OFFICERS QUALIFIED IN TACTICAL FIGHTER SYSTEMS. REQUIRES LANGUAGE ABILITY IN MOST INSTANCES ALONG WITH ABILITY TO FUNCTION IN QUASI-DIPLOMATIC ENVIRONMENT.

UPT/UNT Instructors (ATC)

REQUIRES MOTIVATED JUNIOR OFFICERS WITH STRONG MILITARY RECORDS AND SOLID FLYING CREDENTIALS IN OPERATIONAL AIRCRAFT.

Civil Air Patrol—USAF

OFFERS WIDE GEOGRAPHIC OPTIONS AND REQUIRES RATED OFFICERS WITH SOLID RATED RECORDS AND DEMONSTRATED POTENTIAL TO FUNCTION WITH STATE AND FEDERAL GOVERNMENT OFFICIALS.

SAC U-2 Program

REQUIRES HIGHLY QUALIFIED PILOTS WITH AT LEAST 1500 HOURS TOTAL, 1000 HOURS JET, FLYING TIME IN TWO OR MORE AIRCRAFT. ADDITIONAL APPLICANTS PARTICULARLY NEEDED AT THIS TIME.

SAC SR-71 Program

REQUIRES HIGHLY QUALIFIED PILOTS AND NAVS FOR DEMANDING STRATEGIC RECONNAISSANCE MISSIONS. ADDITIONAL RECONNAISSANCE SYSTEM OPERATOR (RSO) APPLICANTS ARE PARTICULARLY NEEDED AT THIS TIME.

Officer Exchange Program

REQUIRES RATED OFFICERS WITH OUTSTANDING PERFORMANCE RECORDS ABLE TO REPRESENT THE USAF WITH ALLIED AND SISTER SERVICES.

89 Military Airlift Wing (MAC)

REQUIRES PILOTS AND NAVS OF THE HIGHEST PROFESSIONAL COMPETENCE TO PROVIDE WORLDWIDE AIRLIFT TO HIGH RANKING OFFICERS OF OUR GOVERNMENT PILOTS MUST HAVE A MINIMUM 3000 FLYING HOURS AND NAVS A MINIMUM OF 2000 TOTAL.

USAF Thunderbirds

DUTY WITH THE USAF AERIAL DEMONSTRATION TEAM REQUIRES PILOTS OF THE HIGHEST COMPETENCE, PRIMARILY WITH EXTENSIVE FIGHTER EXPERIENCE, TO REPRESENT THE USAF WORLDWIDE. ★

FLYING WITH

Hundreds of thousands of people—young and old alike—are physically dependent upon drugs—diabetics on insulin, angina victims on nitroglycerin, epileptics on anticonvulsants and high blood pressure victims on diuretics. But their dependency on such drugs is necessary for them to lead a normal, healthy life.

In contrast to these people, there are thousands of others who are dependent on a broad spectrum of drugs which affect them physically and psychologically. These are legal social drugs such as alcohol, tobacco and caffeine; over-the-counter drugs; legally prescribed drugs such as amphetamines, barbiturates and tranquilizers; and illegal "hard" drugs. Somewhere near the middle of this drug spectrum is marijuana (affectionately known by users as pot, tea, grass, weed, or Mary Jane), a growing concern in our society and a potential threat to aviation safety.

When smoked, marijuana quickly enters the bloodstream and within a few seconds (minutes at the most) begins to affect the user's mood and thinking for two to four hours.

The psychological effects on the emotions and senses vary widely depending on what the user ex-

"MARY JANE"

LT COL DAVID H. KARNEY, M.D.
Medical Division
US Army Agency for Aviation Safety

pects from the drug, the circumstances under which it is used, and the strength and quantity of the drug. Time is distorted and five minutes may seem like an hour. Space may seem enlarged or otherwise distorted, and sound and colors sometimes seem intensified. Thought frequently becomes dream like, and some individuals believe they are thinking better than usual. Recent evidence shows that there is a loss of immediate recall and that it is difficult to think or speak due to disorganization of recent memory.

JUDGMENT AFFECTED

Like alcohol, marijuana affects judgment, and an individual may find it much harder to make decisions which require logical thinking. At the same time, he may erroneously believe that his judgment is unimpaired, or even that his mental functioning has been enhanced by the drug. The performance of any complex task which requires good reflexes and clear thinking is impaired, making such tasks as driving or flying particularly dangerous.

Marijuana, like all intoxicating drugs including alcohol, has no place in our aviation environment. While few aviation accidents have been reported in which marijuana usage by maintenance personnel or aircrewmembers was a factor, it is a well-known fact that use of the drug is widespread among servicemen and it would be naive to think the aviation population has not been affected. The absence of documented marijuana-caused accidents is grossly misleading since proof of intoxication is, for all practical purposes, impossible at the present time.

However, there is information available concerning the effects of marijuana on an aviator's flight ability. An informal inquiry conducted by the University of California revealed that social marijuana smoking is not an uncommon practice among civilian-type aviators, some of whom reported that they had even flown while "high" on marijuana. For this reason, the University conducted an experiment to determine the effects of the drug on the aviator's ability to operate aircraft.

The test was conducted in instrument flight simulators using seven professional and three private pilots who had smoked marijuana socially for several years. Before actual testing, the aviators were familiarized with four consecutive 4-minute holding patterns, which included maneuvers encountered in instrument flight; straight and level flight; turns; pitch, roll, and yaw maneuvers; radio navigation, etc. These tasks required coordination as well as short term memory, concentration, and orientation in time and space. Two flights consisted of a standard holding pattern and two of a modified holding pattern requiring altitude changes. Also, mild turbulence was added so that aviators would be required to continually manipulate the controls to maintain the desired attitude. These flight profiles were carefully chosen to demand a high level of flying skill to correctly complete the sequence.

FLYING SKILL DEGRADED

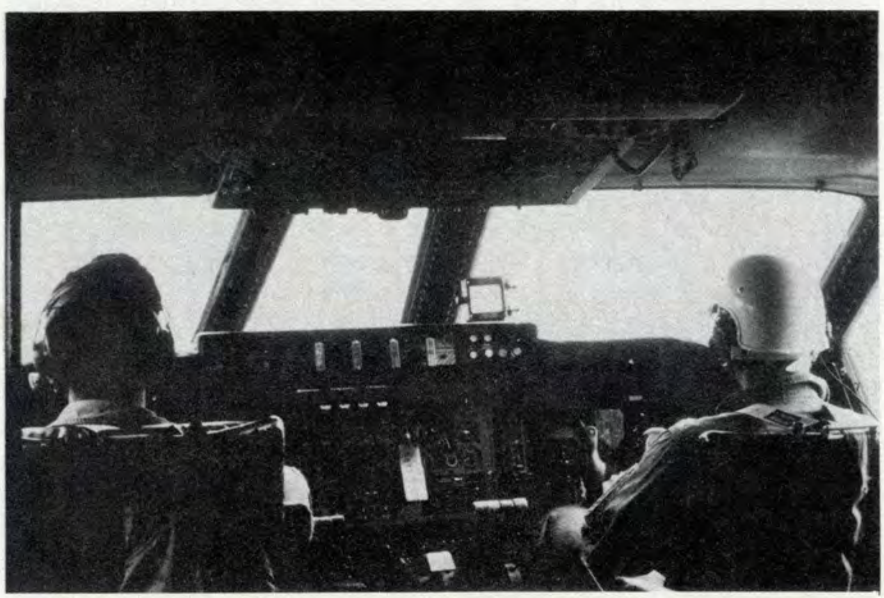
Once the pilots were proficient in operating the simulator and in performing the holding patterns, two tests were conducted one week apart. Unknown to the pilots they were separated into two groups with each group serving as its own control in two separate tests to validate the results. Before the first test, one group smoked a placebo (containing no active drug). For the second test, the pattern was reversed. Flying performance of the pilots was then

FLYING WITH "MARY JANE"

TABLE 1—Average Performance of 10 Pilots 30 Minutes After Smoking Marijuana or Placebo (Values Indicate Total Deviation From Assigned Flight Path During Entire 16-Minute Flight Sequence for Pilot Group).

	ACTIVE	PLACEBO
PULSE	107	73
HIGH RATING	10.5	0.5
ALTITUDE (METERS)	797	207
HEADING (DEGREES)	627	332
RADIO NAVIGATION (CDI UNITS)	100	42
MAJOR ERRORS	2.9	0.4
MINOR ERRORS	4.5	0.7

Marijuana, like all intoxicating drugs including alcohol, has no place in our aviation environment.



evaluated. In contrast to the placebo, marijuana caused a gross decrement in flying performance with increased prevalence of major and minor errors, altitude and heading deviations, and radio navigation errors. (See table 1.) The effects of the drug persisted for at least 2 hours, generally disappearing within 4 to 6 hours after it was administered.

Several major problems were noted in flying the simulator while under the influence of marijuana —the most significant being its effect on short-term memory and time sense. Aviators often forgot where they were in a given flight sequence or had difficulty recounting how long they had been performing a given maneuver in spite of the presence of written instructions and a stopwatch. Marijuana also appeared to cause alterations in concentration and attention, so that pilots would become preoccupied with one task. As an example, several pilots noted that, following concentration on one particular flying task, they could not tell how long they had been flying or where they were located in the flight sequence. Once they realized this, they would then overcontrol the aircraft in correcting for errors in tasks which they previously had ignored. At times they exhibited a complete loss of orientation with respect to the navigational fix. This loss of orientation occurred when the pilots were either daydreaming, lapsing, or focusing on one certain part of their specified routine.

Although the results noted were quite dramatic in the flight simulator, it is believed that pilot performance in actual flight situations would be even more adversely affected by marijuana. The pilots tested performed a memorized flight sequence and had the instructions for the pattern in front of them at all times. In actual flight situations, instructions come sequentially from an air traffic control specialist and must be accurately noted and repeated (i.e., read back) by the pilot.

Unfortunately, there has been little research into the effects of marijuana intoxication on personnel performing specific jobs such as aircraft maintenance, air traffic control, or other support duties. However, the effects of marijuana upon human performance, particularly those tasks requiring a high level of skill, memory, interpretation, awareness, and judgment, have been well documented. Based on this research and on the detrimental effects of marijuana intoxication on the performance of aviators, it is logical to assume that job performance of all aviation-related personnel would be affected.

MARIJUANA VS ALCOHOL

There is much controversy about the use of marijuana versus the use of alcohol. Note the following opposing statements comparing marijuana and alcohol intoxication.

"Marijuana perhaps more than any other drug is the NOW generation. Not just the hippies or the dropouts or the alienated but the doctors, lawyers, and all kinds of chiefs of tomorrow say marijuana is it. It is better than booze—no hangover. It is a mind drug, not a body drug, while alcohol and nicotine are known to be responsible directly or indirectly for much illness and many deaths. It is a euphoriant in a world that needs joy, not the obliteration of sensation that accompanies alcohol. It is not addicting, whereas hard liquor is. No one dies when they stop using it; some have died when they stopped drinking. It represents and is part of a new attitude toward life while alcohol is regressive."

On the other hand . . .

"Nonsense. Marijuana smoking is frequently the first step toward dropping out of life. It sometimes leads to the use of even more dangerous drugs. It has not been studied enough to say it is harmless. It is a symbol of attitude that will destroy our country and lower everyone's standard of living. Alcohol does present problems but it is the drug of choice in all of the more technologically advanced countries, so it cannot be too bad. Marijuana, on the other hand, is used only in the backwater countries of the world."

Regardless of the pros and cons, we know that alcohol is a dangerous drug physically, psychologically or socially for millions of people whose drinking is out of control, that it is a factor in one-half of all highway accidents, and that it has also been a factor in numerous aircraft accidents. And, based on the limited research presently available, there is no firm evidence that "pot" would be less harmful if used as consistently as alcohol.

Although marijuana is not a narcotic and does not appear to cause physical dependence such as heroin or other hard narcotics, users of marijuana are more frequent abusers of other stronger drugs. This may be sociological, but the relationship does exist.

PENALTIES SEVERE

The use of marijuana is illegal and the penalties for possession are severe. According to the federal legal controls based on the Controlled Substance Act of 1970, unlawful possession is punishable by up to one year imprisonment and/or fines of up to $5,000. A second offense can be punishable by up to twice the imprisonment and fines of the first offense.

Unlawful distribution of marijuana, or possession with intent to distribute, is punishable by up to 5-year imprisonment and/or fines of up to $15,000 plus 2 years of required special parole. A second offense can be punishable by imprisonment or fines up to twice that of the first offense. State laws vary as to the punishment.

Today, the effects of marijuana upon human performance is an area of major concern. No place is this concern more critical than in complex man-machine systems, such as those found in aviation, where even the slightest degradation in either flying or maintenance performance can result in catastrophic losses.

—Courtesy March 1977 US Army Aviation Digest ★

THERE IS A WAY

Annually the Air Force recognizes a given number of individuals, units and commands for outstanding performance. However, competition is keen and not all win major awards. To recognize all of those, AEROSPACE SAFETY is featuring one or more in each edition. In this way we can all share in recognizing their fine performance and, perhaps, learn some valuable lessons.

Nominated for the Columbian Trophy

318th Fighter Interceptor Sq, ADCOM

More than 8,000 flying hours in 1976, five consecutive years of accident-free flying for which they received the USAF Flight Safety Certificate. This is the record the 318th FIS has established. At the end of 1976 the 318th had flown 43,000 hours without an accident. They went without a single incident attributable to aircrew error during 1976.

A major effort of the 318th, for several years, has been to assist in the development of the Airborne Warning and Control System. Almost 400 sorties were scheduled for 1976. In addition, the squadron conducted four major deployments and participated in 16 exercises directed by higher headquarters while maintaining full alert posture.

To create a safer operation environment, an exchange program was devised whereby newly assigned weapons controllers are brought into the squadron for briefing on every aspect of the fighter mission from the pilots' perspective and given the opportunity to observe the entire fighter operation first hand. Fighter crews are given the opportunity to observe an entire intercept training mission while at the controller's position. The better understanding by both parties contributes to a safer operation.

The accident-free year of 1976 enabled the 318th FIS to extend its record to 65 months without an accident, a significant contribution to Air Force mission capability.

Nominated for the Koren Kolligian, Jr., Trophy

Captain David W. Becker

75 MAS, TRAVIS AFB, CA

Sunday, 19 September 1976: Captain Becker, the IP, and his crew were scheduled for a local C-5 training flight. During departure Captain Becker simulated a bird strike on nr 1 engine and retarded the throttle. The student pilot made a three-engine approach, a missed approach and entered the radar pattern for a precision approach. Immediately after the aircraft turned base, a "Bleed Duct Hot" light illuminated. Seconds later Captain Becker noted an overheat warning on nr 2 engine, terminated the simulated emergency, restored power on nr 1 and retarded nr 2 to idle. The overheat warning continued. Fifteen seconds later, a fire was indicated in the left inboard wing and pylon.

Faced with multiple emergencies, Captain Becker directed shutdown of nr 2 and called for the emergency checklist. A scan of nr 2 engine and the left wing indicated smoke coming from the nr 2 engine area. The IP declared an emergency and directed a turn to final. With the fire light still on, the engineer continued to discharge fire suppressant into the hot area. Then two thrust reverser lights illuminated. Captain Becker attributed these to fire damage to electrical components.

For a few seconds there was no smoke, then the scanner reported flames coming from the nr 2 pylon and left wing. With the situation deteriorating, Captain Becker directed an immediate landing on the nearest runway. On short final the nr 1 engine and left outboard fire warning lights came on. Captain Becker took control and made the landing. After the brakes were set and the remaining fire handles pulled, the crew evacuated and turned the problem over to the fire department. Total length of time for the emergency: 5 minutes. ★

Professionals Don't Assume

MAJOR PAUL TILEY
Directorate of
Aerospace Safety

Look around your squadron. Who are the professionals? What makes them that way? The chances are that they know their jobs and they always seem to be knowledgeable about other people's jobs. That means they don't take things for granted. The professionals go out of their way to find out more than the bare minimum. The professionals don't assume, they know.

What can happen to you when you start assuming that other people are doing your job for you? Here are two examples of what can happen when you stop being professional and assume.

• Two young pilots who had just recently graduated from pilot training were flying a T-38 for proficiency. The flight had gone well and after clearing the runway, the aircrew stopped to perform their after-landing checks. As they were almost finished with their checks, the T-38 started to roll. Each pilot ASSUMED that the other had finished his checks and was taxiing the aircraft. The aircraft ran off the taxiway without causing any significant damage.

• The check ride had not gone according to plan. The flight was delayed taking off due to thunderstorms and gusty surface winds.

Finally airborne, the two ships proceeded to the range, which, it turned out, was closed due to weather. Proceeding back to home base, the flight contacted approach control which gave them home base weather. The gusty surface winds were out of crosswind limits, but the flight had miscalculated them as being within limits.

The wingman "assumed" that, since the flight lead did not say anything about the winds, everything was OK. The flight lead "assumed" that the Supervisor of Flying (SOF) was monitoring the weather and would advise the flight if anything was wrong.

To complete part of the check, the flight lead requested multiple approaches stating that the flight was a stan/eval check. The approach controller did not understand the request and denied the multiple approaches, "assuming" that if it was important the flight lead would repeat the request. The flight lead "assumed" the controller had some reason for not approving the request but did not question it. The flight split up and the wingman landed and experienced some directional control problems that he "assumed" was hydroplaning on the wet runway, but did not advise anyone. The flight lead didn't pay any attention to the winds that GCA was giving him, still "assuming" that the SOF would advise him if the winds were out of limits.

Lead landed and the aircraft started to drift to the edge of the runway, but the leader failed to apply proper controls and the aircraft departed the runway, causing major damage.

Flying is a complex job. More than ever the old adage, "if you don't know or understand, ask!", applies. Questioning when you aren't sure is far less embarrassing than answering questions after a mishap. ★

YOU AND THE D.A.:

MAJOR PHILIP M. McATEE
Directorate of
Aerospace Safety

It's that time of year again when your normally frisky "air machine" can start acting like it needs a trip to a health spa. It seems to act as if some gremlin had decreased its wingspan and detuned its engine(s). Takeoffs seem like your bird has an affair going with the runway, and then it climbs like the proverbial lead brick.

There is probably nothing wrong with your aircraft, the "gremlins" are most likely caused by an increase in *density altitude.*

We all know that as altitude increases, atmospheric pressure decreases. So we know, for example, that the takeoff roll from a high elevation field will be longer than from a sea level field. The reason for this is that the air is thinner (we all know that!), and as it becomes thinner it loses much of its load lifting ability. This thickness or thinness of the air may be thought of as density altitude. But is the air always the same density at the same altitude? Absolutely not! It changes constantly. To review why, let's see what density altitude really is, and then why it changes.

Density altitude is nothing more than *the altitude which the density of the air represents, regardless of the true elevation above sea level.* If the density (mass per unit volume) of the air was measured at a sea level airport one hot afternoon and found to be the same as an elevation of 5,000 ft, then the density altitude is 5,000 ft even though the actual elevation is sea level. Density altitude is affected by atmospheric pressure and temperature. In order for us to be able to measure those two factors, we need a standard. The standard atmospheric pressure at sea level is 29.92 inches of mercury and standard temperature at sea level is 15°C(59°F).

In other words, density altitude and actual elevation are the same only when barometric pressure (corrected to sea level) is 29.92" Hg and temperature is standard for the elevation (15°C or 59°F at sea level). We know these conditions are by far the exception instead of the rule. So you can see by using *actual* field elevation for calculating aircraft performance, we can be off considerably and that can get hairy. Not only will a higher density altitude give you less lift but it also reduces your engine thrust. To demonstrate the effect let's look at some examples from some typical aircraft performance charts.

As you can see, the effect of only a 50 ft increase in pressure altitude and 15°C increase in ambient temperature give a sea level field a density altitude of 2,200 feet and significantly decreased performance. *For each 9°C of temperature increase, density altitude will increase by approximately 1,000 ft and bring a corresponding decrease in performance.*

Remember these performance losses are the result of *both* the thinner air having less lifting ability plus a decrease in available engine thrust.

For an example of the decrease in engine thrust let's look at the T-38: For each 5.5°C rise in temperature above standard (15°C at sea level), there is a 4-5 percent decrease in available thrust. There is also a 2-3 percent loss of thrust for each 1,000 ft pressure altitude increase above sea level.

Thanks to the writers of your Dash 1, all that is necessary to work any of these performance calculations is to know *pressure altitude* (available from your forecaster or by setting altimeter on ground to 29.92" Hg) and ambient *temperature.* The performance charts take it from there and compute density altitude or density ratio and the effect on performance. (If you want to know the density altitude, you can easily get it from your flight computer—P.A. opposite O.A.T. read D.A.).

The point is that every takeoff will be different because of many factors. A good pilot will calculate very closely what performance he can expect, and will be especially cautious when takeoff is from a high elevation and/or air temperature is well above standard. Those kinds of surprises he can live without! ★

C-141A: Wt 300,000 lbs. - No Wind - Dry Runway
Actual Elevation: Sea Level

P. A.	= S. L.	P. A.	= 500'
O. A. T.	= 15°C (59°F)	O. A. T.	= 30°C (86°F)
Density Alt.	= S. L.	Density Alt.	= 2200'
T. O. Gnd Run	= 4300'	T. O. Gnd. Run	= 5200'
Crit. Fld Length	= 5300'	Crit. Fld Length	= 6300'

F-106A: Full Int. Fuel - No Wind - Dry Runway
Actual Elevation: Sea Level

P. A.	= S. L.	P. A.	= 500'
O. A. T.	= 15°C (59°F)	O. A. T.	= 30°C (86°F)
Density Alt.	= S. L.	Density Alt.	= 2200'
T. O. Gnd. Run	= 5600'	T. O. Gnd Run	= 6700'
To Clear 50' obs.	= 7000'	To Clear 50' obs.	= 8900'

THE IFC APPROACH

PARTIAL PANEL FLIGHT

Aircraft throughout the Air Force inventory are continuing to experience failures in their primary attitude indicator systems. Between January 1975 and August 1976, there were 77 attitude indicator failures reported to the Air Force Inspection and Safety Center; the T-38, F-4, A-7, F-111, and B-52 accounted for more than 50 of those reported failures. If you encounter an attitude indicator failure while in instrument conditions, you could find yourself in an emergency situation without a plan and very little time to consider the alternatives. This article is devoted to helping you formulate your "plan."

UNUSUAL ATTITUDE RECOVERIES WITH A MALFUNCTIONING ATTITUDE INDICATOR

Failure to recognize an attitude indicator malfunction often leads to an unusual attitude recovery using partial panel procedures. Successful recovery from an unusual attitude situation with a malfunctioning attitude indicator depends upon the early recognition and confirmation of the attitude indicator failure and timely application of the correct recovery procedures. Let's look at the unusual attitude "Recognize, Confirm, and Recover" steps:

Recognize that a discrepancy exists between the attitude indicator and the other instruments. Attitude indicator failure should be immediately suspected if you apply control pressures and you do not get the corresponding change on the attitude indicator, or if the performance instruments contradict what you see on the attitude indicator.

Confirm that the unusual attitude exists by cross-checking the other instruments. If a standby attitude indicator is available, check it; in multi-place aircraft, check your copilot's attitude indicator. The turn needle is also an excellent instrument to use to confirm your attitude or to use as the "tie breaker" between two conflicting attitude indicators. Cross-check the performance instruments to confirm the unusual attitude and to determine whether the aircraft is climbing or diving. Depending on your particular aircraft, you may have some other aids available to bring in to the cross-check such as, the radar horizon, heads-up display, gunsight, etc.

Recover from the unusual attitude using the following recommended techniques, unless your flight manual dictates otherwise:

FIXED WING AIRCRAFT:

If diving, level the wings by rolling away from the turn needle, to center it, and recover from the dive with adequate back pressure. Adjust the power or drag devices as appropriate.

If climbing, use power as required. If the airspeed is low, or decreasing rapidly, add power and bank using approximately a standard rate turn on the turn needle until reaching level flight (banking the aircraft will aid pitch control). Care must be taken not to use full needle deflection because overbanking could result in an undetectable, inverted position. If the small turn needle on a flight director system is used, center the turn needle during the recovery instead of using the standard rate turn; this is because on the small turn needle, it is very difficult to distinguish between a standard rate turn and full needle deflection.

When reaching level flight during the recovery (when the altimeter reverses direction), center the turn needle and slowly adjust the control pressures until the altimeter stops. Don't forget that the lagging vertical velocity indicator (VVI) may not indicate level flight at the same time as the altimeter movement. When the VVI has stabilized, try to keep it at zero. It is important to trim the aircraft for an airspeed when level; without trim, you cannot tell if the desired pitch attitude is being maintained.

ROTARY WING AIRCRAFT (HELICOPTERS):

If diving, eliminate any bank—check that the turn needle is centered, and if not, center it by rolling away from the turn needle. Recover to level flight by using aft cyclic and adjusting the collective (power) to a known power setting. Level flight is best determined by reversal of the altimeter indication.

If climbing, maintain positive G loading on the aircraft by adjusting the collective (power) to a known power setting and banking the aircraft by reference to the turn needle; however, ensure that the turn needle is not fully deflected. Return to level flight using cyclic control (watching for the reversal of the altimeter). Once established in level flight, eliminate the bank by centering the turn needle, and return to the desired flight parameters by adjusting collective and cyclic inputs as required.

WHAT TO DO NEXT . . .

Tell someone! If you encounter complete attitude indicator failure in instrument conditions, you are definitely in an emergency situation; don't delay declaring an emergency and telling the controlling agency the nature of your problem so that they can provide any possible assistance.

Get VFR if possible; this will minimize your problems. Your weather briefing should provide some clues as to whether to climb or descend to get VFR and the lo-

By the USAF Instrument Flight Center
Randolph AFB, Texas 78148

cation of the nearest VFR field. If you are able to get VFR, but realize that you must penetrate the weather during your descent, consider requesting assistance from another aircraft to lead you through the weather. If you cannot get VFR, and there is no one to lead you through the weather, you still have a number of options:

Use Alternate Systems. Consider "covering" the malfunctioning attitude indicator to keep it out of your cross-check. If a standby attitude indicator is available, practice the "new cross-check" long enough prior to the approach, so that it becomes comfortable. If a standby attitude indicator is not available, things are tougher, but not impossible . . .

For Pitch Control, cross-check the altimeter and VVI. Use standard power settings for specific airspeeds, keep the aircraft trimmed, and use the autopilot if available.

For Bank Control, use the turn needle and cross-check the heading indicator for any movement which would indicate a bank.

Pick a penetration and approach that will minimize the pitch and bank inputs. Approaches with holding patterns, arcs, and penetrations with high descent rates should be avoided if possible since they are difficult to fly with a malfunctioning attitude indicator and the chance of getting into an unusual attitude is increased. Radar vectors with a shallow enroute descent will provide a good recovery to limit the pitch and bank inputs. Start the descent far enough out so that the descent gradient will be shallow. Use a descent rate that is comfortable, remembering that a high rate of descent makes the level-off more difficult.

When you begin the enroute descent, slowly lower the nose until the VVI reads the desired value and trim the aircraft for that vertical velocity. Maintaining this rate during the descent will allow you to control your descent gradient. Lead the level off by more than the normal 10% of the vertical velocity to allow for the slower level-off made by referencing the VVI and the altimeter.

What type of final approach should you plan to fly once you've

INSTRUMENT APPROACH PROCEDURE CHARTS
RATE OF DESCENT TABLE
(ft. per min.)

A rate of descent table is provided for use in planning and executing precision descents under known or approximate ground speed conditions. It will be especially useful for approaches when the localizer only is used for course guidance. A best speed, power, attitude combination can be programmed which will result in a stable glide rate and attitude favorable for executing a landing if minimums exist upon breakout. Care should always be exercised so that the minimum descent altitude and missed approach point are not exceeded.

ANGLE OF DESCENT (degrees and tenths)	GROUND SPEED (knots)										
	30	45	60	75	90	105	120	135	150	165	180
2.0	105	160	210	265	320	370	425	475	530	585	635
2.5	130	200	265	330	395	465	530	595	665	730	795
3.0	160	240	320	395	480	555	635	715	795	875	955
3.5	185	280	370	465	555	650	740	835	925	1020	1110
4.0	210	315	425	530	635	740	845	955	1060	1165	1270
4.5	240	355	475	595	715	835	955	1075	1190	1310	1430
5.0	265	395	530	660	795	925	1060	1190	1325	1455	1590
5.5	290	435	580	730	875	1020	1165	1310	1455	1600	1745
6.0	315	475	635	795	955	1110	1270	1430	1590	1745	1905
6.5	345	515	690	860	1030	1205	1375	1550	1720	1890	2065
7.0	370	555	740	925	1110	1295	1480	1665	1850	2035	2220
7.5	395	595	795	990	1190	1390	1585	1785	1985	2180	2380
8.0	425	635	845	1055	1270	1480	1690	1905	2115	2325	2540
8.5	450	675	900	1120	1345	1570	1795	2020	2245	2470	2695
9.0	475	715	950	1190	1425	1665	1900	2140	2375	2615	2855
9.5	500	750	1005	1255	1505	1755	2005	2255	2510	2760	3010
10.0	530	790	1055	1320	1585	1845	2110	2375	2640	2900	3165
10.5	555	830	1105	1385	1660	1940	2215	2490	2770	3045	3320
11.0	580	870	1160	1450	1740	2030	2320	2610	2900	3190	3480
11.5	605	910	1210	1515	1820	2120	2425	2725	3030	3335	3635
12.0	630	945	1260	1575	1890	2205	2520	2835	3150	3465	3780

FIG. 1

IFC cont'd

descended? If the weather permits, you will probably find that non-precision approaches (TACAN, VOR, ASR, etc.) will be the easiest (and the safest) to fly since they do not require the precise pitch control necessary to stay on a precision glide path. If you think you could do better on a precision approach, try it in your simulator — you'll probably be surprised.

Prior to the final approach fix (FAF), determine the vertical velocity required for a descent from the FAF altitude to the minimum descent altitude (MDA) prior to the missed approach point (MAP). This will allow you to have the time to get the aircraft trimmed for level flight, so you can look for the runway. Non-precision approaches are normally designed to have a maximum descent gradient of 4 degrees (from the FAF to the runway); therefore, if you use a vertical velocity that approximates a 5 degree descent gradient, you will be able to level off at the MDA prior to the MAP. Having some "hip-pocket" descent vertical velocity figures should be part of your "partial panel plan." The rate of descent table (Figure 1), in the front of each instrument approach procedure book, will give you the vertical velocity for a known or approximate ground speed. For example: The vertical velocity for a 5 degree descent at 165 kts ground speed is 1455 fpm.

At the FAF, slowly lower the nose until the VVI reads the desired value and trim the aircraft to maintain this vertical velocity. Make small adjustments on the VVI during the descent to remain on the desired descent gradient. When you approach the MDA, lead the level off by more than the normal amount and slowly decrease the nose down and the altimeter is steady. Adjust the power to maintain the final approach airspeed and trim for that airspeed. Keeping the aircraft trimmed is an important factor as you prepare to make the transition from the instruments to the outside references. If there are others in the cockpit, use them to help you; an additional set of eyeballs monitoring the gauges during the approach might help you keep out of the dirt, rocks, and trees.

No matter what type of approach you choose or what techniques you use to get your partial panel aircraft back safely on the ground, forming a "plan" and practicing ahead of time *is the only way to fly.*

VISUAL DESCENT POINT (VDP)

A new concept named "visual descent point" (VDP) is being incorporated in selected non-precision approach procedures. The VDP is a defined point on the final approach course of a non-precision straight-in approach procedure from which a normal descent from the MDA to the runway may be commenced, provided visual reference with the runway is established. The VDP will normally be identified by DME on TACAN, VOR, and LOC procedures and by a 75MHZ marker on NDB procedures and other procedures where DME cannot be implemented. VDPs are not a mandatory part of the procedure, but are intended to provide additional guidance where they are implemented. A VASI lighting system will normally be available where VDPs are established. Where VASI is installed, the VDP and VASI glide paths will normally be coincidental.

No special technique is required to fly a procedure with a VDP. However, in order to be assured of the proper obstacle clearance, the pilot should not descend below the MDA prior to reaching the VDP and acquiring the necessary visual reference with the runway. Pilots not equipped to receive the VDP should fly the approach procedure as though no VDP has been provided. The VDP will be identified on the profile view of the approach chart by the following symbol; v, as depicted in Figure 2. This depiction shows that the VDP is at the 5 DME.

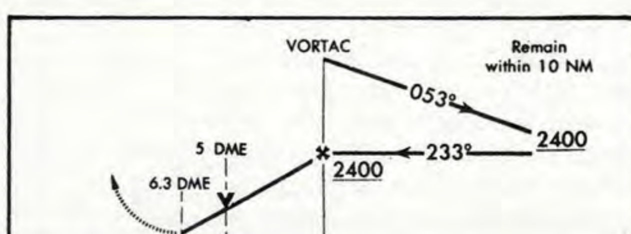


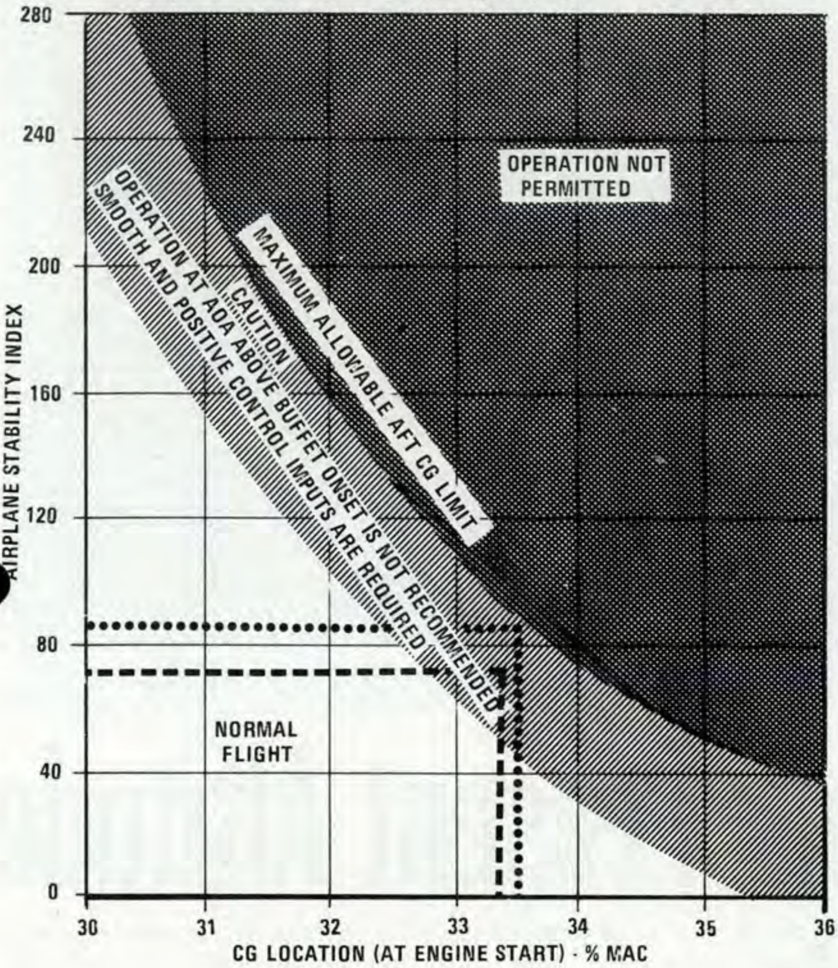
FIG. 2

Instrument flying procedures are written by pilots, for pilots. If you have any questions or comments, call us on AUTOVON 487-427[illegible] (Directives) or 4274 (Procedures).★

HOW STABLE IS YOUR F/RF-4?

MAJOR PAUL L. TILEY, Directorate of Aerospace Safety

AFT CG LIMITS F.4E



LEGEND: TYPICAL F-4E
- - - - - 2 TANKS CG-33.5 STAB INDEX -73.8
••••••••• 3 TANKS CG-33.6 STAB INDEX -87.4

F-4 drivers have known for a long time that under some configurations their aircraft is sensitive in pitch—longitudinal stability. The latest change to F/RF-4 Dash Ones includes an expanded discussion on longitudinal stability. But, two recent mishaps indicate that some of our F/RF-4 drivers don't appreciate the problem of longitudinal stability.

How do you know if you've got a problem? The AFT CG LIMITS chart in Part I of the Performance Data of your Dash One will show you if your aircraft configuration falls in the yellow CAUTION area. You need CG at engine start and Stability Index to determine this. The CG information for your "standard" configurations can be obtained from your Flight Crew Information File (FCIF) or your wing maintenance Quality Control personnel. The Stability Index can be calculated from your Dash One, or your maintenance Quality Control personnel may also have calculated it.

Does it sound like a lot of trouble? A survey of some "standard" configurations shows:

- F-4C/D/E's with typical range loads ALL fall in the yellow CAUTION area.
- RF-4's with "Two Bag" and "Three Bag" configurations fall in the yellow CAUTION area.
- F-4E's with "Three Bags" fall on the edge of the yellow CAUTION area and the red PROHIBITED area.

When you go out to fly ACM or BFM do you know if you fall in the yellow CAUTION area?

If you have been encouraged to check your standard configurations—GOOD. For further study, F-4 drivers might want to look into the benefits and ramifications of the number 5/6 lockout. RF-4 drivers may feel that their configurations don't change much, but there have been two incidents when a pilot took off without any cameras or ballast up front and lost the aircraft.

The majority of F/RF-4 drivers have too long assumed that "somebody else" is looking out for them when it comes to CG and loading configurations. True, your Quality Control personnel have to check these areas, but their only responsibility is to be sure the configuration does not fall in the red PROHIBITED area. It is **your** responsibility to anticipate and avoid control difficulties by knowing whether your configuration falls in the yellow CAUTION area. ★

Figure 1—AAU-34 counter drum pointer altimeter.

Maintain Your Present Altitude

RONALD L. LAMBDIN
Aeronautical Systems Division
Wright-Patterson AFB, OH

One of the most important flight parameters that is monitored by the pilot during every flight is the barometric altitude of the aircraft displayed on his altimeter. How important is this parameter and how accurate must it be to achieve safe operation in flight? These are questions that must be and have been considered during the evolution of aircraft altimeter systems as they exist in the USAF aircraft today. How and why this evolution took place are the answers you must have in order to fully understand the concern over system accuracy and how it should be maintained.

In 1963 the Department of Defense (DOD) joined with the Federal Aviation Administration (FAA) in a program designed to establish more positive air traffic control and to ensure safe control of all air traffic within the nation's airspace. This program, known as the "DOD AIMS Program," involved the addition of capability in all aircraft for automatic aircraft altitude and identity reporting. It became obvious early in this program that to achieve reduced altitude separation and still prevent midair collisions, it would be necessary that the altitude information presented to the pilot and the controller be accurate and reliable.

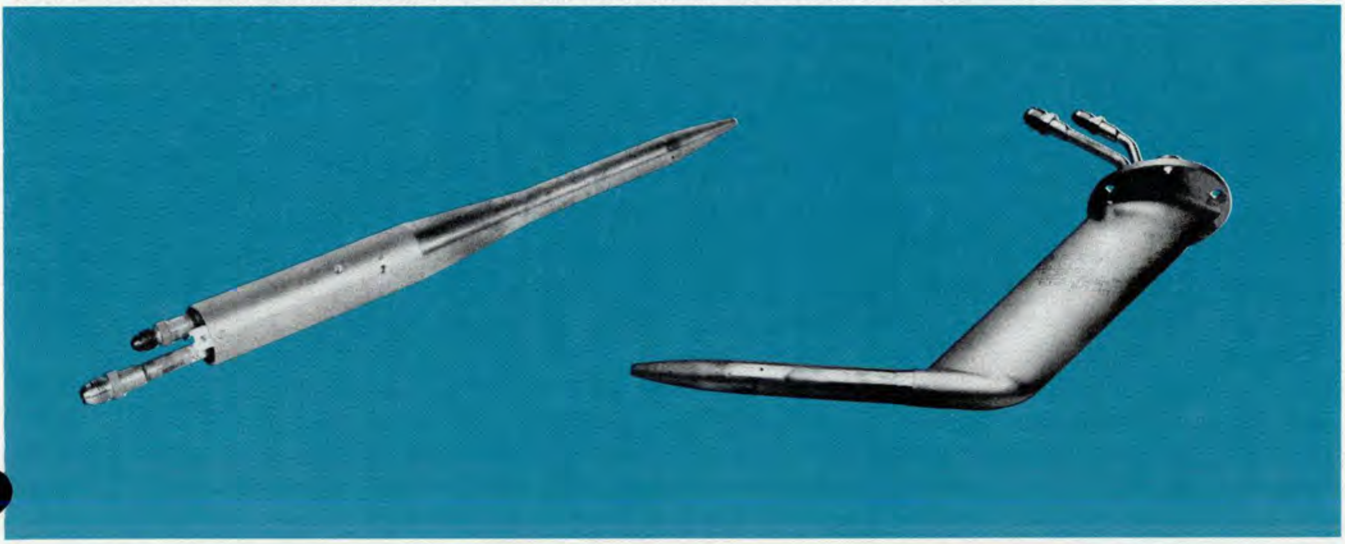
The DOD directive that established the AIMS Program assigned a requirement for an altimetry system with an accuracy of ±250 feet on all military aircraft. This value of system accuracy was established through various studies by NASA, FAA, and DOD. It was concluded that 250 feet was the maximum error that could be allowed in 1000 ft vertical separation airspace. The state of development of aircraft altimetry systems at the time that the DOD directive was issued was such that few systems if any could meet the ±250 feet requirement. Most operational aircraft were equipped with a three-pointer altimeter and flush static ports as the primary source of static pressure. For the military to comply with the direction it became obvious that new equipment had to be developed. The altimetry system that was developed includes the servo-pneumatic counter drum pointer altimeter (Figure 1), an altitude computer, and a pitot-static tube (Figure 2). Each component of the system was designed to meet accuracy requirements necessary to ensure that the overall ±250 feet system accuracy requirement could be achieved.

At this point an explanation of system operation seems necessary. Total and static pressures are sensed by the pitot-static probe and transmitted through tubing to the computer. The computer converts the pneumatic pressures to an electrical analog signal of altitude and then transmits that signal to the pilot's altimeter. The altimeter then converts the electrical output of the computer to an interpretable display form for use by the pilot.

Since aircraft pressure altitude is determined by sensing the ambient air pressure and converting it to an output proportional to altitude, the sensing of accurate static pressure thus becomes very critical in achieving an accurate altitude display. Due to its theory of operation the static pressure sensing device presents a difficult problem in achieving a system accuracy of ±250 feet or better. Because of aircraft and/or sensor influence on the pressure of the surrounding ambient air, the static pressures sensed by the pitot-static tube differ significantly from the actual or true ambient pressure particularly on high performance aircraft. This difference is a function of the aircraft mach number and is commonly referred to as "position" error. The computer includes a correction device which can compensate for this error in static pressure and provide a true altitude signal to the display if the position error is known. The objective becomes finding a repeatable and known value of position error.

The altimeter and altitude computer performances are verified by the manufacturer during production and by logistics and field personnel on the aircraft during altimeter field elevation check and during system ground checkout. The pitot-static tube on the other hand is the basic and most critical component of the system having the largest and most difficult-to-define errors and most uncertain accuracy. This performance of the pitot-static tube, unlike the other components of the system, can only be determined in flight as installed on the aircraft due to the fact that its operation is totally dependent on the aircraft flow field. In flight measurements against a calibrated standard such as a pacer aircraft, therefore, must be made to verify performance and accuracy.

Figure 2—lower left, nose mounted pitot static tube. Lower right, fuselage mounted pitot static tube.



Maintain Your Present Altitude continued

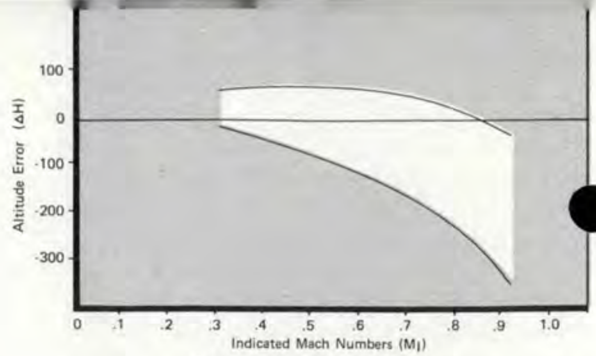


FIGURE 3. T-38 DATA ENVELOPE

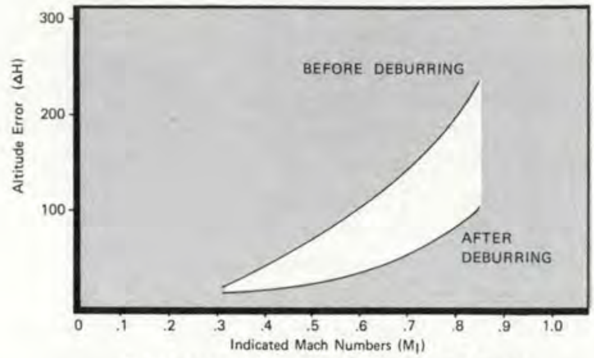


FIGURE 4. FLIGHT TEST DATA – EFFECT OF REWORK

Since it was necessary to retrofit most aircraft with a new pitot-static system for the DOD AIMS Program a series of flight tests on each aircraft was necessary to define the position error. In most cases the flight testing was conducted on only one prototype aircraft of each type and involved the identification of the position error for the aircraft for inclusion in the computer. Once this was accomplished, the correction was mechanized in a protoype computer and flight testing was repeated until it was verified that the system would meet the ±250 feet requirement. Once this was completed it was assumed that the pitot-static error was adequately defined for a series of aircraft and all aircraft of that series were retrofitted with the system as flight tested. Was this assumption valid? Are those calibrations still adequate for systems that have been operational for up to 10 years? What factors, if any, cause a pitot-static system to vary from its original calibration?

The design of static pressure sensing systems is very susceptible to variations in the condition of the sensing element. Of course, variations due to differences in manufacturing tolerances are the most obvious to consider. Such variations are controlled with adequate quality inspections and by comparison with a standard tube during manufacturing. Other factors, however, occur as a result of operational damage to the tube or system on the aircraft. Some typical factors are deformation/physical damage, foreign material in the static orifices, variations in aircraft skin (flush static port installations), errors due to system leakage, and variations in tube mounting.

It may be properly assumed that such conditions exist on military aircraft due to the environment under which most aircraft systems are maintained. Data to support this conclusion exists on the F-104, F-4C, T-38 and A-7D aircraft and is summarized below. A test program was conducted by AFFTC on four F-104 aircraft equipped with a nose mounted pitot-static tube to determine position error repeatability and to determine if the position error correction in the F-104 was representative of operational aircraft. The data shows as much as 200 feet variation may exist between F-104A type aircraft in the high mach cruise flight regime.

Standard F-4C/D aircraft are equipped with flush static ports and were not retrofitted with new pitot-static tubes. A visual inspection was conducted on the flight test F-4C aircraft and revealed that the static ports were not aligned to the tolerances as specified in USAF F-4 technical orders. Tests were conducted at AFFTC on the F-4C with the static ports in various configurations. The data indicates that variations in static port alignment can create a variation of up to 300 feet in altitude error at high subsonic mach numbers. Several operational F-4C/D aircraft were inspected and it was concluded that approximately 70 percent of operational systems did not meet TO requirements. From the data derived from the F-4C testing and the results of other studies it may be concluded that aircraft equipped with flush static ports are more susceptible to large variations in position error and that on some aircraft these errors can be of such a magnitude as to cause the total system not to meet the ±250 feet requirement.

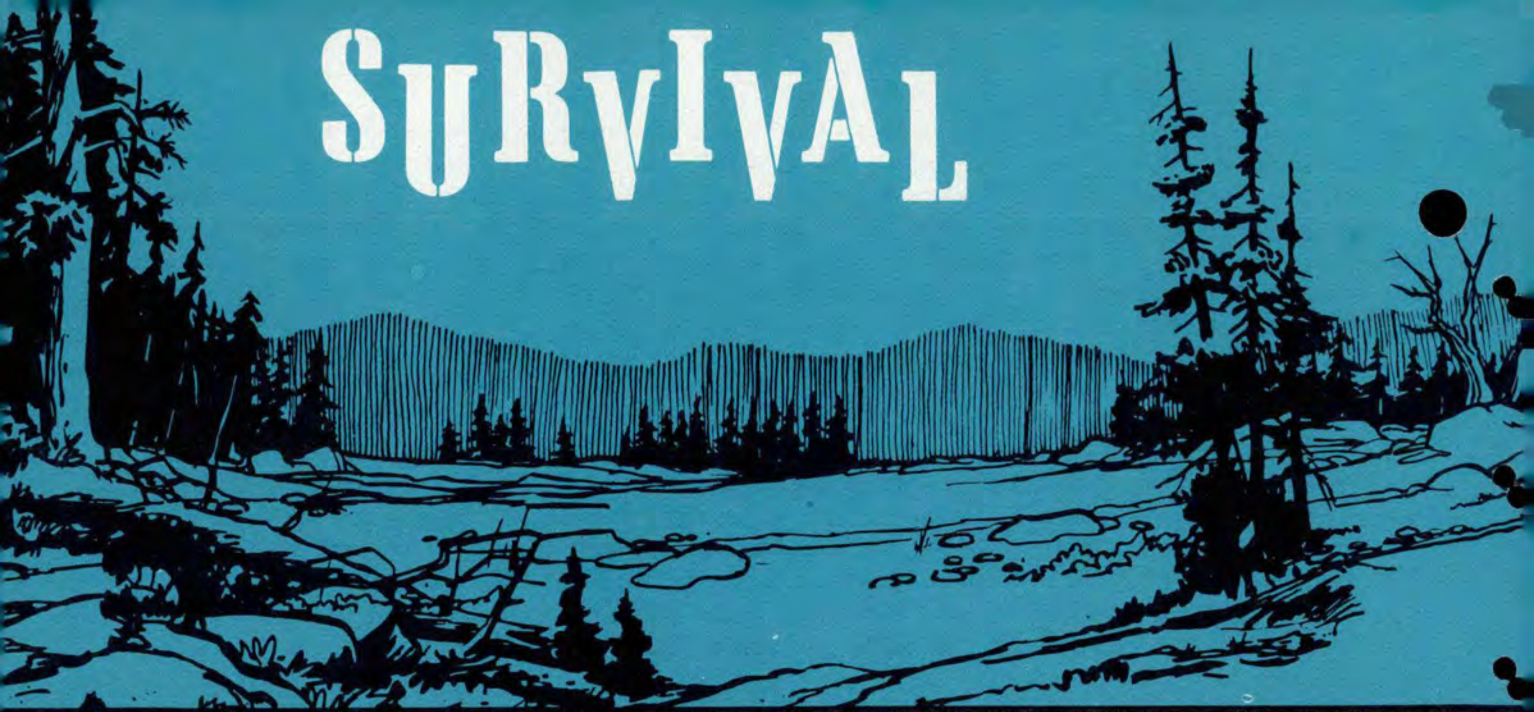
Considerable flight test data has been collected on the T-38 aircraft nose mounted pitot-static system since the aircraft was developed (Figure 3). The correction data for the computer was based on the data collected during the initial calibration conducted in the early 1960's. As a result of later testing, it became clear that the correction curve might not be representative and that the T-38 pitot-static system accuracy was not repeatable. The most significant outcome of the test program on the T-38 aircraft is data showing the effect of static ports deformation on position error. A pitot-static tube was chosen from the T-38 test fleet and was deburred and retested. Variation as large as 180 feet (Figure 4) in altitude error was caused by burrs in the static port on that particular tube. Another significant finding was obtained from the flight testing on four T-38 aircraft equipped with their own production pitot-static tubes. The four aircraft consisted of three new aircraft and one older aircraft. The results of the flight tests showed that the position error on the new aircraft matched the position error obtained with new production and reworked tubes. The older aircraft showed a position error much different from the position error shown on the other three aircraft. The data from the test showed approximately a 120 foot difference between the older and new installations. Visual inspection revealed that the tube on the old aircraft showed evidence of erosion, appeared to be out of round, and at least one port was partially blocked. Obviously this was an older aircraft with an older tube and had been subjected to much more abuse than had the newer tubes on the other three aircraft. It is clear that there can exist considerable variation in the pitot-static system position error between T-38 aircraft. It is also clear that some of the data scatter could be reduced with a program of periodic inspection of the static ports.

The A-7D is equipped with L-shaped pitot-static tubes. As much as 200 feet variation was noted between four A-7D aircraft during flight testing at AFFTC. It is interesting to note that these aircraft were tested in controlled conditions during which the tubes were checked for damage, and removed and replaced when necessary and the static system was inspected and leakage was maintained at the minimum level possible. The conditions for the AFFTC tests must, therefore, be described as better than the normal operational environment. If such a variation can be encountered in near ideal conditions, then the variation in the field must be larger.

At this point, several items of concern have been identified but only a few answers have been presented. The importance of altitude information and the required accuracy has been shown. Action taken so far by the USAF and other military and civilian organizations to achieve a goal of safer operation in the nation's airspace has also been presented with some shortcomings. The main point of all the information and data presented is that altitude information cannot and should not be taken for granted. The efforts of field level personnel in maintaining accurate systems are just as important as that of the flight test pilot or engineer in achieving an accurate system initially. As discussed previously, the altimeter and computer are tangible items that can be checked with field test equipment to determine accuracy. The pitot-static tube is not so simple as one would think. The tube can only be checked for precise operation with a formal flight test. There are methods, however, for field personnel to determine whether or not a tube may or can be suspected as being bad. The most obvious method is a close visual inspection by field maintenance or even flight personnel. If a tube is bent, deformed, eroded, scratched, burred or otherwise damaged in the vicinity of the static ports then the integrity of the tube is questionable. Care must be taken when installing a new tube to follow proper installation procedures and take care to avoid ground damage.

Operational pilots can also do their part in this effort. One method would be to perform a makeshift flight test during formation flying. Each aircraft in this method would be considered as a "pacer" for each and every other aircraft in the formation. Each pilot monitors the altimeter reading and verbally communicates his reading to the other pilots. Any large disparity on one or more of the aircraft would be noted and would then be reported to the ground maintenance personnel after landing. Ground checks of the computer and altimeter could then be made and if those checks showed both components to be within required accuracies then it could be logically concluded that the pitot-static system/tube was bad.

ASD is continuing work in this area to better define system accuracies and to establish criteria and methods for better maintenance of aircraft systems. Consideration is being given to periodic flight testing either at time of aircraft overhaul or at a qualified test facility such as AFFTC. In the meantime the only way we in the USAF can be sure of our system integrity is to provide proper maintenance of the system. The methods described above are suggestions as to how to accomplish this action and to assure safe operation. The next time you witness someone using a tube for a step or a chinning bar, or polishing the ports, just remember that is not the way to maintain your present altitude. ★



Your Problem, Too

CAPT RONALD E. VIVION, Operations and Requirements Branch
3636 CCTW, Fairchild AFB, WA

"Sir, Captain Smith, reporting for duty."

"C'mon in, Captain Smith. Have a seat. We've been expecting you for some time. Glad to have you aboard, and welcome to Survival."

"Thank you, sir. I'm glad to be here."

"Good. Well, before I start my in-brief, let's get acquainted. Your first name is Tom, isn't it?"

"Yes, sir."

"OK, Tom, I understand you're coming from F-4's. I think you'll find survival both interesting and rewarding. We have a great bunch of guys here who are dedicated to a worthwhile mission—saving lives. Have you gone through any of our courses?"

"Yes, sir. I went through basic survival here at Fairchild in 1969 and then the Jungle School at Clark AB that same year before my first tour in SEA."

"Well then, you know pretty much what we're all about. And I'm counting on your background to help us out. I don't mean to put you under the gun immediately, but we have a problem around here that you might be able to solve for us. Give us sort of a fresh look at an old forest, so to speak."

"What's that, colonel?"

"Well, it concerns the scope of our training and our capabilities. What did you think of our course when you went through?"

"It was fine, but I don't want to ever go through it again."

"Why?"

"Well, I don't enjoy being harassed and called names and chased through the forest at a high rate of speed."

"Did those things happen to you?"

"Yes, sir."

"Well, did you learn anything at the schools?"

"Yes, I suppose I did. I learned never to get shot down and never to get captured."

"Besides that, did your attitude about your own abilities change any?"

"Yes, sir, now that you mention it. The first thing I did after I got home from Fairchild was to take my wife on a long hike in the woods, and I'm not a woodsey guy. I felt more confident somehow. Actually, I was rather proud that I had made it through the training."

"OK, how about today? Do you still feel that confidence?"

"Yes, sir. That's the thing I remember most about Survival. I

...on't remember all the specifics, like how to make a jerky rack for curing food or what type of fire to use, but I still remember how I felt when I finished."

"OK, Tom. The specifics are the key to the problem I mentioned. When you went through our schools, did we teach you about equipment items like the radio, and what was in your kit?"

"I really don't remember."

"Well, in the F-4, what type of survival radio did you carry?"

"I think it was the PRC-90, but I'm not really sure."

"When you were in SEA, did you carry any radios?"

"YES, SIR. I carried two URC-64's with spare batteries. They were in my vest and I treated them with respect."

"Why the difference? In SEA you knew a lot about the radio in your vest, but today you're not sure?"

"Well, in bad-guy country that little jewel was my only way out, and the chances were pretty good of having to use it."

"OK, back to my question then. Where did you learn about the radios if you can't remember whether or not they were taught in Survival?"

"The PE troops at the life support shop went over them with us. We had annual training and, of course, the initial check-out in the aircraft, and in SEA we checked both radios daily. That helped a bunch."

"OK, Tom, I'll stop beating around the bush. When you went through Survival you **were** taught the equipment. But, like the difference between today and SEA, the motivator wasn't there. But more importantly, and here's our problem, we were and still are very limited in the amount we can cover with each crewmember. For example, a survival instructor picks up a crew of students and asks what aircraft types are represented. Out of the eight students, he is liable to get one intelligence specialist, a C-141 loadmaster, two F-4 drivers, a B-52 navigator, a tweet IP, an A-7 pilot and a crew chief on a C-130. Do you think he will be able to cover, in detail, all the equipment items for each of those aircraft in the two weeks they have at Survival?"

"He might be able to if the kits are standardized, sir."

"I'm here to tell you, Tom, that they are not. Many things enter into the picture—type of mission, space available, environmental area, etc. So the survival instructor tells his students that he can cover the principles of the equipment and generally how to use it, but the student has got to get with his life support shop for the specifics. That same student hears that quite a few times in his stay here. So, when he gets home the A-7 driver, for example, knows the principles, but it's the specifics he's missing. Now do you see the problem, Tom?"

"Well, not exactly, sir. The life support shop should be able to give him the details."

"Oh, they do—and do it well in most cases. But Tom, think back. In SEA you were vitally interested in your equipment. But lately, when was the last time you used your survival equipment, or even thought about it?"

"Gotcha, sir. What can we do, though?"

"I think if we made it easier for a crewmember to get the information, we would go a long way toward solving the problem. Also, we need a means of gently reminding him or her about the equipment. Here's an idea. Often, when faced with a large amount of information, an individual doesn't know where to begin. I mean, it's like going into the life support shop and asking them for a personal briefing on everything. The guy just doesn't know what questions to ask first."

"Sir, how about a checklist of items each student can carry home and use for briefing? It would cover the most important things and maybe simplify both his job and that of the life support troop. On top of that, it could be used as a reminder of the equipment on hand."

"Good idea, Tom. Think you could work one of those up?"

"Yes, sir, be glad to."

So ended the first conversation of a new staff officer with his boss. The checklist was made and is now being passed out to all students in our survival courses. It's reprinted below just in case you haven't seen one. It isn't designed to do more than key people to those specifics we can't cover in resident survival courses. But, the uses may be greater than they appear on the surface. How about it, stan-eval types? Do you require your "checkees" to show knowledge of their survival gear? If you do, more power to you. If you don't, that checklist may help you remind yourself of the gear on board, and then you can do your thing.

Jot down the answers on a card and stick it in your checklist binder—then you not only will know more about your equipment, but should have a better handle on **using** it.

Questions or comments concerning this article should be referred to 3636 CCTW/DOTO, FAIRCHILD AFB WA 99011, or AUTOVON 352-5470. ★

Survival Checklist

Ask the following questions of your life support technician for each of the areas below:

1. Where is it located?
2. What are the normal operating procedures?
3. What are the emergency operating procedures?

ITEMS

1. Survival Kit.
2. Life Raft.
3. Life Preserver.
4. Survival Radio.
5. Locator Beacon.
6. Lowering Device.
7. Sleeping Bag.
8. Minimum Survival Kit.
9. Personal Survival Kit.

OPS TOPICS

GEAR UP LANDING (SOME LESSONS LEARNED)

A T-37 was making a precision approach with visibility one-half mile in thundershowers and fog. At about 1½ miles on final, the aircraft began drifting right of centerline. The GCA controller issued a series of heading corrections but at 1 mile the aircraft was too far right for a safe approach, so he directed a missed approach. The IP initiated the go-around and retracted the gear. At this point he saw enough of the runway to decide to attempt a landing. Touchdown occurred on the speedbrake with gear retracted. Although the RSU observed the gear position and transmitted on Guard, the aircrew did not hear the transmission because they had turned off the Guard receiver.

COVER ALL BASES

Following an aircraft qualification mission, a T-39 returned to home base for visual patterns. During two touch and go landings the left MLG strut compressed more than the right strut. On the final landing, the right main strut did not compress, while the left strut compressed fully, resulting in a right wing high, 18° bank attitude. Despite the crew's efforts, the aircraft drifted left. At approximately 90 knots, rudders were neutralized and nose wheel steering engaged to keep the aircraft on the runway. As the aircraft was turned back towards runway heading, a popping was felt on the right side, and the right main tire blew. The aircraft stopped wings level. Investigation revealed that internal binding in the right strut prevented normal compression until a right side load was induced. The same aircraft had landed right wing high two days previously; at that time improper servicing was attributed as the cause. The message is that units encountering a strut extension problem should not discount the possibility of strut binding.—Sqn Ldr Peter A. White, RAAF, Directorate of Aerospace Safety.

ACCIDENT REPORT

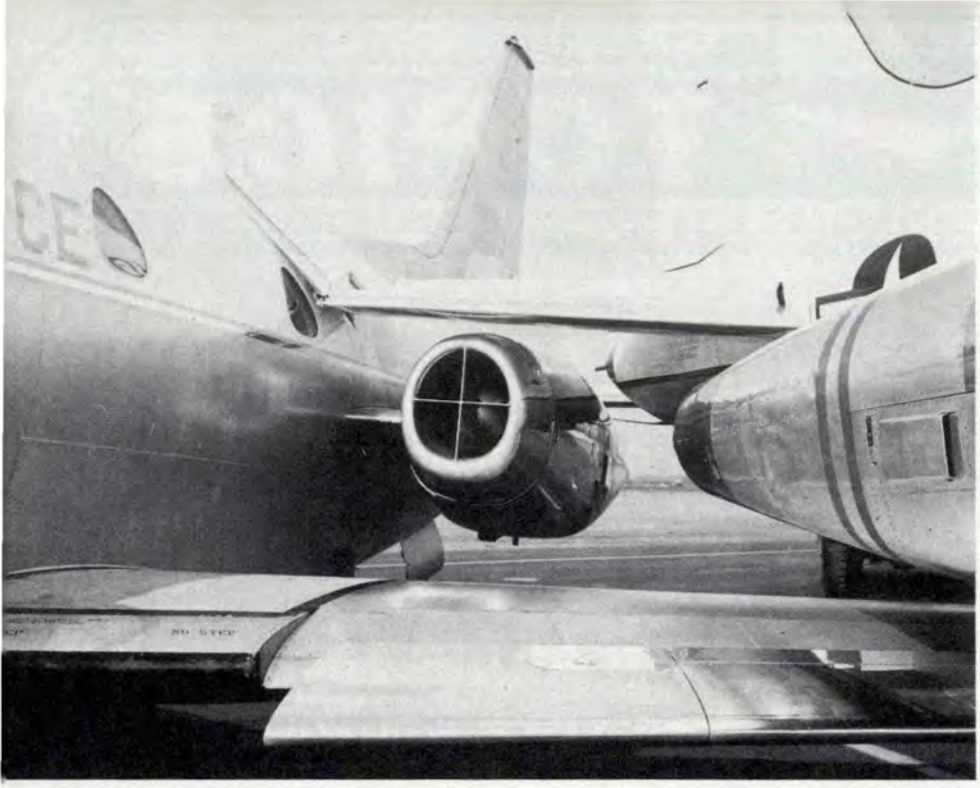
The National Transportation Safety Board has released its report on a Boeing 727 accident at Ketchikan, Alaska, in April 1976. The jetliner over ran the runway threshold, crashed into a ravine and caught fire.

The Board stated that the probable cause of the accident was "the captain's faulty judgment in initiating a go-around after he was committed to a full stop landing following an excessively long and fast touchdown from an unstabilized approach." As a contributing factor the Board cited the pilot's decision to abandon his precision approach.

In summary, the Board said the conduct of the approach, landing and post landing maneuvers was below that expected of an experienced, qualified captain. Additionally, the other flight crew members should have recognized the progressively deteriorating situation and taken positive action to correct a dangerous situation.

A LOTTA DIRT

The FAA reports in *General Aviation Inspection AIDS*, that when wheel fairings were removed from a Piper PA-28, 23 lbs of dirt were found in each fairing. The aircraft had been flying from an unpaved runway. Some of our aero clubs must operate off dirt at times, so this is an item that should be checked. Otherwise, who knows, the fairings might collect enough dirt to freeze the wheel and cause a blown tire. ★



taxi anyone?

WHAT PRICE CARELESSNESS?

MAJOR CLEVELAND SIMPSON
Directorate of Aerospace Safety

Within the Air Force, most of the attention on aircraft mishap prevention is focused on those mishaps associated with flight. This is, perhaps, as it should be, since flight mishaps are apt to have the most serious consequences in terms of destroyed aircraft, damaged property and loss of life. However, the Air Force suffers dozens of aircraft ground mishaps each year which, although not normally as spectacular or costly as flight mishaps on an individual basis, nevertheless causes millions of dollars in damages and seriously impact mission capability.

Since CY 1970, there have been more than 600 mishaps involving improper aircraft ground operation at a cost of 47 million dollars! Taxiing mishaps accounted for fully one-third of the aircraft ground mishaps experienced by the Air Force during the period 1970—April 1977.

While the typical taxi mishap generally results in acutely embarrassed crew members and only slight or minor damage to aircraft, such as a crumpled wing tip, it can be every bit as spectacular and costly as its in-flight counterpart. A classic example was a mishap which occurred some time ago involving a tanker aircraft participating in a simulated launch exercise. While being taxied back into its parking spot, the aircraft sustained major damage when the left wing tip struck an 82-foot, single bank mass apron lighting tower. The impact sheared off the left wing tip and caused the light tower to collapse on top of the aircraft, piercing the fuselage and puncturing both the aft body and upper deck fuel tanks. The primary cause (which was used then) for this mishap was pilot error in that he did not taxi so as to maintain sufficient clearance to avoid an obstacle. Contributing causes were (1) taxiing too fast for existing conditions, (2) failure on the part of ground marshallers to take action in sufficient time to properly recover the aircraft and, (3) failure to ensure that a standardized taxi reference was established on the tanker alert ramp.

A subsequent, more tragic mishap resulted in several crew fatalities and the destruction of both aircraft when two KC-135's collided while taxiing out at night on a simulated launch exercise. In this case, the primary cause was failure on the part of supervisors to provide the necessary procedures and guidance to preclude occurrence of the mishap. Contributing causes were (1) failure on the part of both pilots to take all available precautions to ensure adequate clearance during taxi, (2) lack of ramp lighting in the alert parking area, (3) restricted visibility due to moisture condensation on cockpit windows, (4) pilot distraction while adjusting thunderstorm lights and, (5) inadequate airfield marking of alert parking spots and taxiway lead-ins to afford safe separation for aircraft free-flow movement.

Although the above mishaps are somewhat dated, they reflect the same general cause factors commonly seen in the most recent mishaps of this type. The fact that these cause factors are still prevalent in our current mishaps indicates that we have learned little in this area over the years. Although the Air Force has experienced few taxi mishaps of the same magnitude in the past couple of years, this is attributable to an incredible stroke of good luck rather than the imposition of effective preventive measures. Given the right circumstances, it only takes a small mistake to initiate a catastrophic mishap.

A review of mishap data for the period 1970 through April 1977 confirms that people are still making the same mistakes as the ones which led to the two mishaps noted above.

The causes of most taxi mishaps fall within the broad categories of operations, logistics or support. The most common causes within each category are shown in the following paragraphs.

OPERATIONS

By far the most frequent cause of taxi mishaps is pilot error. Typical mishap findings are:

(1) Taxiing too fast for existing conditions.

(2) Failure to maintain sufficient clearance to avoid an obstacle or another aircraft.

(3) Failure to use wing walkers in accordance with Air Force Regulation 60-11.

(4) Improper braking technique.

(5) Taxiing off paved surfaces.

(6) Use of excessive power while taxiing.

LOGISTICS

Although pilot error is the most common finding in taxi mishaps, logistics personnel are not entirely without blame. Following are some of the more common errors on the part of logistics personnel that have led to aircraft taxi mishaps in the past.

(1) Parking AGE too close to aircraft.

(2) Failure to warn the aircrew of insufficient clearance in time to prevent a collision.

(3) Leaving AGE and other vehicles unattended on an approved taxiway.

(4) Parking aircraft improperly on the parking ramp.

SUPPORT

Within this category, deficiencies in airfield facilities were the predominant contributors to taxi mishaps. Some of the more common findings are:

(1) Taxi areas not properly marked.

(2) Aircraft parking spots not marked to allow sufficient clearance between aircraft.

(3) Oversaturated ramp parking areas which create hazardous taxiing conditions.

(4) Unmarked obstructions on ramp and taxiway areas.

(5) Taxi reference strips faded or not properly marked to ensure adequate wing tip clearance.

The more common types of damage sustained by aircraft during taxi mishaps normally occur in the areas of (1) wing tips (twisted, buckled or sheared), (2) drop tanks (dented or punctured), (3) horizontal and vertical stabilizers (twisted, buckled or sheared), (4) fuselage (gouged or punctured), and (5) nose (radome punctured or broken).

As might be expected, most taxi mishaps involve large transport or bomber aircraft. The obvious reason for this is the difficulty of maneuvering large aircraft on the ground. They require more room, take longer to stop, and are more difficult to see out of than smaller aircraft. On the other hand, size is not always a factor. Fighters and other small aircraft have suffered their share of taxi mishaps. Indeed, review of past mishap data reveals that the cause factor most common to all mishaps of this type is personnel error—either the result of poor judgment or plain negligence. Regardless of the aircraft's size or existing conditions, the one thing necessary for a mishap to occur is a goof on the part of the aircrew or ground personnel.

Surprisingly, materiel failure has seldom been the primary cause of taxi mishaps; it usually comes about only as the result of a chain of events initiated by some human failing. A good example is failure of the landing gear because the aircrew misjudged the aircraft's distance from the edge of the taxiway and taxied off the paved area.

In reviewing the literally hundreds of mishaps of this type, one is driven to ask the question "How can the same mistakes keep happening over and over again during a simple routine operation such as taxiing an aircraft?" The question provides a clue to its own answer. By their very nature, simple, routine tasks seem to breed inattention, complacency and outright carelessness in the best of us. That is what causes a pilot to attempt to negotiate a difficult turn in a congested area, without wing walkers, because he's "done it a thousand times," or a crew chief to leave a tow vehicle unattended on an active taxiway because he'll "only be gone a minute." Can't happen to you, you say? Don't bet on it! ★

THE FUEL FLOW GAGE

HAROLD POEHLMANN
Fairchild Republic Co

Occasionally a "vintage" Aerospace Safety *magazine article has a message with as much contemporary value as it did when it was first published. "The Pilot's Best Friend" is being republished because we notice that when aircraft mishaps are in progress with air starts being a part of the "get well' procedure, aviators do not always direct their attention to the pilot's best friend, the fuel flow instrument. Not only will increased reverence toward this instrument help your in-flight "troubleshooting" but your observations of its readings can simplify accident investigations.*

There is nothing a pilot dislikes more than a "nonrated" or maintenance man giving advice on how to run his machine. However, in this case I have a message that I am certain will prove to be a thought provoker. It is based on observations from experiences dating back to the early jet flying in 1946.

In almost every accident and incident involving engine flameout which required a restart, the narration indicates the average pilot places his attention on the wrong instruments during the restart attempts. This sounds like an indictment, but it's true.

During the 1947 period, the F-84B aircraft had a fuel system placard in the data case for the pilot to consult during moments of anxiety when attempting to locate some wayward fuel. Of course, this placard portrayed three tanks, two lines, and a couple of pumps and it didn't take more than 300 feet of altitude to "dope" it out. The present day machines are a bit more complex fuel-system-wise, and you'll be at "low key" altitude before you can figure out which side of the fuel system schematic is up (in fact the fuel system schematic is no longer required to be placed in the cockpit—I guess for this very reason).

The formal reports usually state, "I opened the throttle and didn't get any rise in EGT, so I then . . .;" "I opened the throttle and the EGT didn't move, so I switched to emergency and still the EGT remained on the peg . . .;" "I pushed the airstart switch and opened the throttle and the rpm didn't increase from the windmill speed. . . ."

On every aircraft you fly, it is very necessary to be able to mentally picture the basic fuel system and remember the location of at least the following two items: Main boost pressure warning transmitter (fuel supply inlet pressure), and the fuel flow meter.

This subject boils down to a simple statement of fact; you can't start an engine if there is no "juice" available. If fuel is not available, don't waste time making airstarts until you correct the condition. Your morale is bound to go out the tail pipe along with the ambient air on each non-start attempt, so favor the adrenaline producing organs by making the first start productive. This can only be accomplished by glueing your eye to the fuel flow instrument during the initial start technique. It is not my desire to get involved with altitude, airspeed and other special aircraft model requirements, but the fuel flow is the primary ingredient for a light-off. This is the most important instrument observation during an in-flight airstart. It will indicate if the engine is receiving fuel; if it reads zero, save your time and put your limited attention on the aircraft fuel supply system, i.e., warning lights, selector position and liquidometer readings, and other fuel supply paraphernalia. A knowledge of the fuel flow instrument power source is a good idea in order to ensure the instrument has power during the emergency period.

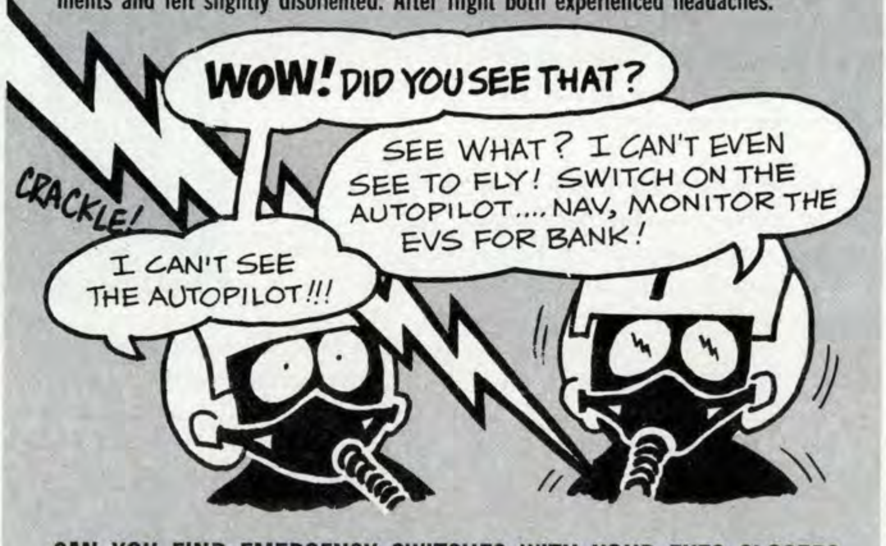
Obviously if the main boost light is illuminated, it is signaling there is low or no fuel flow from the aircraft boost system and in all probability the fuel flow indication will be non-existent. The corrective action is obvious. As the saying goes, "first things first."

Correcting a fuel supply problem is a subject that varies with aircraft and obviously a good knowledge of the basic fuel system is of paramount importance.

Not only is the observance of the fuel flow indication important to the prompt restarting of the engine during those terrifying moments (tell the truth, they are terrifying—unless you have more than one "hot air generator"), but the most important gage reading for the ground crew or anyone attempting to reconstruct a flameout is "what" you saw on the flow meter.

The official records would surprise you by how seldom there is mention of the fuel flow reading. I remember one incident where nine airstarts were attempted, and at no time did the pilot observe the fuel flow. There is no doubt there are many instruments demanding attention, but increased use of this important fuel flow will prove to be of value in the successful in-flight starting of your jet engine. ★

Flight was scheduled as a night training sortie including low level. During an en-route descent the aircraft entered clouds at 11,000 and encountered light rain. As it was passing 6,500, wings level, lightning struck the left front of the aircraft. The flash was so brilliant that both pilots were temporarily blinded. The copilot regained enough periphereral vision in about 10 seconds to determine the attitude of the aircraft. Even after 10 minutes the pilots had difficulty focusing on instruments and felt slightly disoriented. After flight both experienced headaches.



CAN YOU FIND EMERGENCY SWITCHES WITH YOUR EYES CLOSED?

GENERAL

FLY SMARTER

The lieutenant colonel, a rated Air Force pilot, took off with a passenger in the back seat of a privately owned T-34. Minutes later both were dead—victims of an attempt to perform an aerobatic maneuver at too low an altitude to permit recovery.

Witnesses said the aircraft was flying parallel to the runway when it pulled up and appeared to enter a clover leaf maneuver. The aircraft stalled, then leveled out momentarily and finally struck the ground before completion of the recovery. The pilot violated a Federal Aviation Regulation by performing aerobatics below 1,500 ft.

If that were the only case of its kind, we would probably write it off as a fluke and forget it. But it wasn't an isolated event; in just a little over two years there have been 19 fatal general aviation aircraft accidents in which the pilot was a member of the Air Force. Eleven of those were Air Force rated pilots. Seven of the accidents resulted from loss of control—stall/spin, and in six of them the pilot was an Air Force rated pilot. That doesn't square too well with our image of the highly skilled, professional Air Force pilot. But let's get back to that later. Now some more stats.

There were 37 fatalities of which 25 were members of the Air Force. Pilot factor was the cause in 12 accidents, undetermined in six and materiel factor (engine failure) in one.

There were basically three reasons for these accidents, under the broad cause of pilot factor. They were loss of control—stall/spin; attempting flight beyond the capability of the pilot—primarily in weather—and poor judgment. Let's look at some of these.

There were four known and one suspected accidents in which the pilot attempted to fly in weather that exceeded his (and usually the aircraft's instrument) capability. For example, an A1C with a total of 70 hours flying time died along with his passenger when the Piper Cherokee 140 they were flying crashed. The pair was on a cross country when they encountered thunderstorms. The pilot descended to maintain VMC and struck the ground at 2,000 ft MSL.

A master sergeant was following another aircraft in poor weather over a mountain pass. The two aircraft stayed within sight of each other until they ran into a solid overcast. They descended through a hole to follow the highway across the pass. At the top of the pass, the lead pilot turned, and the master sergeant followed. He lost the road and attempted to climb out, but the right wing struck a tree at 4,500 MSL. Neither the pilot nor the aircraft was equipped for instrument flight.

A similar accident involved a senior master sergeant who dropped down to 30 feet above the trees while trying to follow a highway in marginal weather. He had several opportunities to land at airports along the way but declined, even though his destination was forecast to be below minimums. As he topped a ridge he encountered IMC and attempted a one-eighty. In the turn his right wing struck a tree and he crashed. Weather at the site was zero zero in fog. The aircraft was not equipped for instrument flight and no flight plan had been filed.

Weather was involved in these accidents but poor judgment appears to be the real cause factor, as in the following case. A young air-

A good pilot will approach a flight in a bug smasher in the same concerned manner he

man took a civilian friend for a ride in a Grumman TR-2. With a total of 100 hrs flying time, he probably had more confidence than skill and knowledge. They were seen flying across a lake at less than 100 feet. They flew into a box canyon and tried to make a one-eighty, but there wasn't room and they crashed into the canyon wall. The canyon is three miles long by 500 feet wide and 300 to 3,300 feet deep.

These cases involved pilots with relatively low experience. While they are certainly regrettable, they are typical of many general aviation accidents that occur each year.

What is disturbing is the professional pilot who apparently misjudges his aircraft's capability in relation to his own skill. Few USAF aircraft today equip a pilot to fly aerobatics in a light plane without considerable practice and the exercise of good judgment. An example is the accident involving the lieutenant colonel in the T-34.

Here's one with a different twist but same results. A lieutenant and a passenger were killed when the

would in a high performance job. Just because it's fun doesn't mean you can take it lightly.

Cessna 120 the lieutenant was piloting crashed. He attempted a maximum performance climb from 300 ft, ran out of airspeed, stalled and . . . the inevitable. The lieutenant was an Air Force helicopter pilot with 200 hours of general aviation time.

Another tragic crash claimed two lives. An Air Force rated captain had built a BD-4, a high wing monoplane. The pair loaded the aircraft with, among other things, a motor bike. The aircraft was estimated to have weighed at least 1,950 lbs at takeoff. According to witnesses, the captain started the engine and immediately taxied to the runway where he made a quick mag check and rolled. The takeoff was up hill and the aircraft accelerated slowly. Finally it became airborne and gained enough altitude to clear some trees. Then it stalled, nose high, and descended through the trees to the ground where it burst into flames.

Another Air Force rated pilot, a lieutenant, allowed a Cessna 150 to stall with fatal results for himself and a passenger. They were attempting slow flight at 200-400 AGL, over 7,400 ft terrain. The aircraft stalled, entered a spin and impacted 45° nose low. A possibility in this accident is one that frequently causes trouble. All of the lieutenant's previous light aircraft time was in a T-41 with 210 horsepower. The Cessna 150 had 100 horsepower, a big difference especially at altitude.

That accident is reminiscent of one that occurred a few years ago when a woman pilot failed to clear a ridge shortly after takeoff in a Cherokee 140 from a strip at 7,000 feet. The Cherokee just couldn't make it, and the aircraft stalled and crashed. The pilot's experience had been in an aircraft with much higher horsepower.

One of the things that the military pilot who flies light aircraft must remember is that the laws of physics apply to the light plane in exactly the same way as they do to a supersonic fighter or a many-engined bomber or transport.

Two lieutenants apparently forgot this while attempting to stunt a Luscombe 8A. The aircraft stalled and spun to the ground. In every case of this type over the past two years, the maneuvers that the pilots were attempting were performed at such a low altitude that, in the event of a stall, recovery was impossible.

Flying light aircraft is great fun, but those airplanes are not toys. You have to know the rules and obey them or the little airplane will let you kill yourself. If pilots attempt to fly in weather without proper instrumentation or the skill to fly on instruments, then they can expect trouble. And that's not very smart.

If you want to fly aerobatics, fine, but do it at an altitude high enough to permit recovery in case you stall.

If you are going to accept the responsibility of carrying passengers, you owe it to them to not take unnecessary risks.

If you fly light airplanes, think about the fact that with one—possibly two—exceptions all of the 19 fatal accidents in this study resulted from poor judgment on the part of the pilot. ★

MAIL & MISC.

Send your thoughts, ideas, comments, and questions to:
Editor, Aerospace Safety Magazine – AFISC/SEDA – Norton AFB, CA 92409

MAJOR GENERAL BENJAMIN D. FOULOIS MEMORIAL AWARD

1. Congratulations to the ANG for winning the Benny Foulois Award for aircraft accident prevention in 1976 (back cover, March 1977 **Aerospace Safety**). This award is the oldest of Daedalian Trophies, and is the one most intensely sought by us TAC-types.
2. If you want to call it a "USAF Safety Trophy," OK. But how about a little credit to the Order of Daedalians (the fraternity of military pilots), who are the **real** presenters of this trophy. Daedalians champion the cause of flight safety in all the services and among the air carriers, presenting trophies in each category.
3. We owe us one.

CHARLES B. NEEL, Lt Col, USAF
Chief of Safety, 4TFW (TAC)
Seymour Johnson AFB NC
Flight Captain, Kitty Hawk Flt (No 8)
Order of Daedalians

Reference the back cover of the March 1977 **Aerospace Safety** magazine.

We Daedalians were somewhat amazed to learn that the Major General Benjamin D. Foulois Memorial Award has become a USAF Safety Trophy. We were always under the impression it was a Daedalian Award since its conception in 1938 when it was first presented to the 19th Bombardment Group.

Incidentally we have it here in the office ready to present to the Air National Guard on the 21st of May in Denver, Colorado.

THEODORE W. GUY, Col, USAF (Ret)
National Adjutant
Order of Daedalians
Kelly AFB, TX

You are correct; we were remiss. The Major General Benjamin D. Foulois Memorial Award—formerly the Daedalian Trophy—is presented by the Order of Daedalians to the major command with the most effective aircraft accident prevention program for the preceding year, as selected by the Air Force. Thanks for calling this oversight to our attention.—Ed.

Outstanding airmanship and a professional approach to flying are not limited to rated aircrews. The following story is an example of exemplary flying skill and judgment.

MSgt Gary D. Arthur is a certified flight instructor for the England AFB Aero Club. Just before sundown, during a cross country flight with two student pilots, the engine of the Cessna 172 failed at approximately 2,500 feet AGL. MSgt Arthur took control of the aircraft and set up a glide. He had been keeping track of the aircraft position and knew that there was a landing strip nearby. Although the strip was closed, MSgt Arthur was able to sight the runway at about 3 miles. He advised the controlling agencies of his plight and then executed a perfect engine out landing in the gathering dusk.

Although MSgt Arthur is not eligible for the USAF Well Done Award, his actions are in the same fine tradition of those USAF crew members so honored. The staff of **Aerospace Safety** wish to congratulate MSgt Arthur for his fine performance and outstanding airmanship.

A FORECAST UPDATE

	1977 FORECAST*	MISHAPS as of 2 Jun 77
Control Loss (Pilot)	8	4
Collision with Ground (Nonrange)	8	5
Collision with Ground (Range)	6	3
Midair Collision	6	1
Landing (Pilot)	12	4
Takeoff (Pilot)	3	0

*Includes all Class A but only Class B mishaps with losses greater than $50,000.

In April we told you about the 1977 mishap forecast. We also asked you to help prove the forecast wrong. This month we are giving you a how-goes-it report on those categories that are locally preventable. The right hand column above shows how many mishaps we've had in the categories. As you can see we aren't doing much to prove the forecasters wrong. We really need your help for the rest of the year, if we are to achieve any reductions in mishaps. ★

Name That Plane

This advanced concept aircraft was a ray of hope for advocates of strategic air power. For answer see inside front cover.

☆U.S. GOVERNMENT PRINTING OFFICE 1977 789/855/47

UNITED STATES AIR FORCE

Well Done Award

Presented for outstanding airmanship and professional performance during a hazardous situation and for a significant contribution to the United States Air Force Accident Prevention Program.

FIRST LIEUTENANT
Alan C. Stockstad

CAPTAIN
Bruce S. Bennett

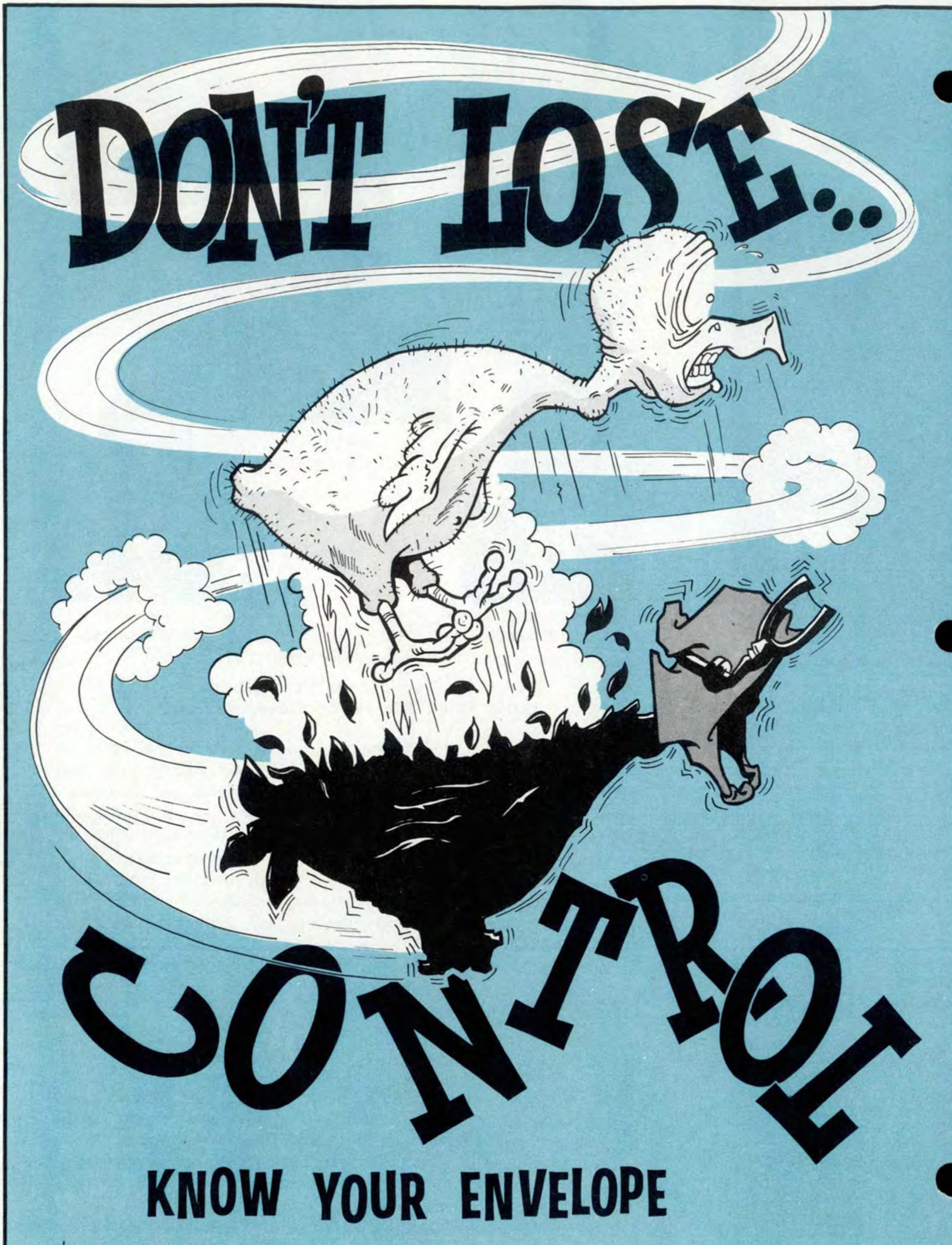
FIRST LIEUTENANT
George F. Nemeyer, Jr.

TECHNICAL SERGEANT
Charles A. Burnette

SERGEANT
Daniel A. Bordessa

50th Tactical Airlift Squadron
Little Rock Air Force Base, Arkansas

On 13 October 1976, Captain Bennett and crew departed Frankfurt AB, Germany, for a flight to Italy in a C-130E. Approximately one hour enroute, the right hand AC Bus OFF light illuminated, and the number four generator was turned off. Minutes later, the generator failed with both voltage and frequency dropping to zero. Reset attempts failed and the engine was shut down. Captain Bennett declared an emergency, requesting an immediate return to Frankfurt AB. Shortly thereafter, number three generator out light illuminated and the flight engineer could not reset the generator. Captain Bennett decided the emergency warranted an immediate landing. During descent the number two generator failed and the ATM generator was checked and turned on. At 10,000 feet MSL, Captain Bennett requested the lowering of gear and flaps. The loadmaster, Sergeant Bordessa, confirmed the gear was down and locked and the flaps were down. When the number one generator failed with no response to resetting, radio contact with Nancy/Ochey, France, Approach Control was established and vectors to a PAR approach requested. The controller reported a 500-foot ceiling with one mile visibility. Then the ATM generator failed leaving the aircraft operating on battery power; however, prior to DH the aircraft battery lost power and all electrical systems failed. At 300 feet above the ground the aircraft was clear of clouds. The runway was sighted approximately one-half mile ahead and the landing was made on three engines. The professional competence and prompt reactions of Captain Bennett and crew not only prevented the loss of a valuable aircraft, but also averted possible injury or loss of life. WELL DONE! ★


DON'T LOSE...
CONTROL
KNOW YOUR ENVELOPE
HARDISON